TRACE-P C_1-C_5 Alkyl Nitrates: Production, Evolution and Distribution

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Planned TRACE-P alkyl nitrate papers:

1. **Distribution:** "Latitudinal and vertical distributions of C_1-C_5 alkyl nitrates in the troposphere over the western Pacific Ocean during TRACE-P"

2. **Production and evolution (kinetics):** "Production and evolution of C_2-C_5 alkyl nitrates in tropospheric air influenced by Asian outflow"

Alkyl Nitrate Measurements during TRACE-P

	Parent RH	Daughter $RONO_2$	
C_1	methane	methyl nitrate	($MeONO_2$)
C_2	ethane	ethyl nitrate	($EtONO_2$)
C_3	propane	1-propyl nitrate	(1-$PrONO_2$)
	"	2-propyl nitrate	(2-$PrONO_2$)
C_4	*n*-butane	2-butyl nitrate	(2-$BuONO_2$)
C_5	*n*-pentane	2-pentyl nitrate	(2-$PeONO_2$)
	"	3-pentyl nitrate	(3-$PeONO_2$)

Detection:	0.02 pptv
Precision:	2%
Accuracy:	10-20%

Alkyl Nitrates

- **low reactivity:** serve as reservoir for long-range transport of NO_x
- explain **lack of closure** in NO_y budget
  - Continents: $RONO_2$ <10% NO_y [e.g. *Ridley et al*., 1990; *Flocke et al*., 1991]
  - MBL PTA: $RONO_2$ 20-80% NO_y [*Talbot et al*., 2000]
- estimate **photochemical age** using $[RONO_2]$ / [parent RH]
- unique opportunity to compare **field** measurements with newly published values from **laboratory** studies

Alkyl Nitrate Production

Two pathways:

1. Marine emissions

- importance ↓ for ↑ carbon number
- varies with latitude

2. Photochemical production

(1)	**RH** + OH· → R· + H_2O	k_1, α_1
(2)	R· + O_2 → RO_2·	k_2
(3a)	RO_2· + NO → **$RONO_2$**	k_{3a}, α_2
(3b)	RO_2· + NO → RO· + NO_2	k_{3b}, $1-\alpha_2$

k = reaction rate constant

α = branching ratio